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NUTTER MCCLENNEN & FISH LLP
WORLD TRADE CENTER WEST
155 SEAPORT BOULEVARD
BOSTON, MA 02210-2604

EXAMINER	
TORRES, JUAN A	
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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/098,628	Applicant(s) OATES, JOHN H.	
	Examiner Juan A. Torres	Art Unit 2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *16 June 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,4-8,10-17,19 and 20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *11-16* is/are allowed.

6)☒ Claim(s) *1,4-8,10,17,19 and 20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

The modifications to the claims were received on 06/16/2006. These modifications are accepted by the Examiner.

In view of the amendment filed on 06/16/2006, the Examiner claim objections to claims 4-8, and 10-16 of the previous Office action.

Response to Arguments

<u>Regarding claim 1:</u>

Applicant's arguments filed on 06/16/2006 have been fully considered but they are not persuasive.

The Applicant contends, "Verdú does not teach all of the features of claim 1".

The Examiner disagrees and asserts, that, as indicated in the previous Office Action, Verdú discloses computing a matrix representing cross correlations among the waveforms, the computing step including performing matrix calculation on at least a first one of two matrix components related by a symmetry property (chapter 4 section 4.2 page 168), to obtain a first portion of the cross correlation matrix the matrix components representing correlations among time lags and codes associated with the waveforms (chapter 4 section 4.2 page 168; the time lag are delays. The definition of cross-correlation is a convolution of a signal with the same signal delayed see equations 4.21 to 4.25 of Verdú); computing a second portion of the cross correlation matrix as a function of its first portion by applying the symmetry property (because the cross correlation matrix is symmetrical see equation 4.28 of Verdú, it is only need to compute

a first portion of the matrix, the lower side of the diagonal, because the second portion, the upper side is identical, that is the reason why the matrix is symmetrical); generating detection statistics corresponding to the transmitted symbols as a function of the cross-correlation matrix (chapter 4 section 4.3 pages 176-194, Verdú presents how to compute the probability of error, BER using the cross correlation see equation 4.47); and estimating symbols transmitted by the respective users and encoded in the waveforms as a function of the cross correlation matrix (chapter 4 section 4.2 figure 4.10 pages 166-175. In Verdú the estimated symbol are represented like $\hat{b}$ in figure 4.10 and are obtained using the Viterbi algorithm see page 172 equation after 4.38 Verdú discloses how the estimation of the transmitted symbol is function of the correlation matrix).

The Applicant contends, "It does not teach performing a matrix calculation on a first one of two components of a matrix representing correlations among time lags and codes associated with waveforms to obtain a first portion of a cross correlation matrix".

The Examiner disagrees and asserts, that, as indicated in the previous Office Action, Verdú discloses to obtain a first portion of the cross correlation matrix the matrix components representing correlations among time lags and codes associated with the waveforms (chapter 4 section 4.2 page 168; the time lag are delays. The definition of cross-correlation is a convolution of a signal with the same signal delayed see equations 4.21 to 4.25 of Verdú).

The Applicant contends, "Verdú does not teach or suggest employing the matrix symmetry for computing the matrix".

The Examiner disagrees and asserts, that, as indicated in the previous Office Action, Verdú discloses computing a second portion of the cross correlation matrix as a function of its first portion by applying the symmetry property (see equation 4.28 of Verdú, it is only need to compute a first portion of the matrix, the lower side of the diagonal).

The Applicant contends, "The mere fact that the H matrix is symmetrical does not imply that the symmetry property is used to compute the second half part of the matrix from the first half of the matrix".

The Examiner disagrees and asserts, that, as indicated in the previous Office Action, Verdú discloses computing a second portion of the cross correlation matrix as a function of its first portion by applying the symmetry property (see equation 4.28 of Verdú, it is only need to compute a first portion of the matrix, the lower side of the diagonal, <u>because the other is identical</u>, in fact <u>Verdú only writes directly on part and repeats the other part, because it doesn't need to be computed again</u>).

The Applicant contends, "Moher does not teach computing a cross correlation matrix using the symmetry property of the matrix components representing correlations among time lags and codes associated with the waveforms"

The Examiner disagrees and asserts, that, as indicated in the previous Office Action Moher discloses to obtain a first portion of the cross correlation matrix the matrix components representing correlations among time lags and codes associated with the waveforms (column 43 line 43 to column 44 line 53; and column 55 line 61 to column 56 line 65; the time lag are delays. The definition of cross-correlation is a convolution of a

signal with the same signal delayed see equation 83 of Moher); computing a second portion of the cross correlation matrix as a function of its first portion by applying the symmetry property (because the cross correlation matrix is symmetrical, it is only need to compute a first portion of the matrix, the lower side of the diagonal, because the second portion, the upper side is identical, that is the reason why the matrix is symmetrical see equation 129 and equations 175 to 178);

The Applicant contends, "Moher utilize the symmetry property to compute a second portion of the matrix as a function of the first portion"

The Examiner disagrees and asserts, that, as indicated in the previous Office Action Moher discloses computing a second portion of the cross correlation matrix as a function of its first portion by applying the symmetry property (see equation 129 and equations 175 to 178. The lower part is identical to the upper part).

Regarding claim 17:

Applicant's arguments filed on 06/16/2006 have been fully considered but they are not persuasive.

The Applicant contends, "Verdú does not indicate that computing the H matrix is achieved by computing a first part of the matrix and then utilizing the symmetry property of the matrix to calculate its second part".

The Examiner disagrees and asserts, that, as indicated in the previous Office Action, Verdú discloses computing a second portion of the cross correlation matrix as a function of its first portion by applying the symmetry property (see equation 4.28 of Verdú, it is only need to compute a first portion of the matrix, the lower side of the

diagonal, because the other is identical, in fact Verdú only writes directly on part and repeats the other part, because it doesn't need to be computed again).

The Applicant contends, "claim 17 recites computing a matrix representing cross-correlations among the waveforms transmitted by the user as a function of a C matrix that represents correlations among the time lags associated with the transmitted waveforms and code sequences associated with the respective users, the computing step comprising computing a first one of two symmetry related matrix components of the C matrix. Moher does not teach these limitations".

The Examiner disagrees and asserts, that, as indicated in the previous Office Action, Moher discloses computing a matrix representing cross-correlations among the waveforms transmitted by the user as a function of a matrix that represents correlations among the time lags associated with the transmitted waveforms and code sequences associated with the respective users, the computing step comprising computing a first one of two symmetry related matrix components of the matrix (column 43 line 43 to column 44 line 53; and column 55 line 61 to column 56 line 65. First component upper triangular part, second component lower triangular part); computing a second portion of the cross correlation matrix as a function of its first portion by applying the symmetry property (because the cross correlation matrix is symmetrical, it is only need to compute a first portion of the matrix, the lower side of the diagonal, because the second portion, the upper side is identical, that is the reason why the matrix is symmetrical); and generating estimates of symbols transmitted by the users and encoded in the

waveforms as a function of the cross correlation matrix (column 43 line 43 to column 44 line 53).

For these reasons and the reasons indicated in the previous Office Action the rejections of claims 1, 4, 17 and 19-20 are maintained.

Regarding claims 5-8 and 10:

Applicant's arguments filed on 06/16/2006 have been fully considered but they are not persuasive.

The Applicant contends, "Schmidl... does not, however, teach or suggest computing a cross correlation matrix by computing a first part of the matrix and then utilizing a symmetry property of the matrix to calculate its second part"

The Examiner asserts, that, as indicated in the previous Office Action, Verdú discloses obtain a first portion of the cross correlation matrix the matrix components representing correlations among time lags and codes associated with the waveforms (chapter 4 section 4.2 page 168; the time lag are delays. The definition of cross-correlation is a convolution of a signal with the same signal delayed see equations 4.21 to 4.25 of Verdú); and computing a second portion of the cross correlation matrix as a function of its first portion by applying the symmetry property property (see equation 4.28 of Verdú, it is only need to compute a first portion of the matrix, the lower side of the diagonal, because the other is identical, in fact Verdú only writes directly on part and repeats the other part, because it doesn't need to be computed again).

The Applicant contends, "Goeddel does not teach computing a cross correlation matrix by computing a first part of the matrix and then utilizing a symmetry property of the matrix to calculate its second part"

The Examiner asserts, that, as indicated in the previous Office Action, Verdú discloses obtain a first portion of the cross correlation matrix the matrix components representing correlations among time lags and codes associated with the waveforms (chapter 4 section 4.2 page 168; the time lag are delays. The definition of cross-correlation is a convolution of a signal with the same signal delayed see equations 4.21 to 4.25 of Verdú); and computing a second portion of the cross correlation matrix as a function of its first portion by applying the symmetry property (see equation 4.28 of Verdú, it is only need to compute a first portion of the matrix, the lower side of the diagonal, <u>because the other is identical</u>, in fact <u>Verdú only writes directly on part and repeats the other part, because it doesn't need to be computed again</u>).

For these reasons and the reasons indicated in the previous Office Action the rejections of claims 5-8 and 10 are maintained.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States

only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1, 4, 17, and 19-20 are rejected under 35 U.S.C. 102(b) as being anticipated by Verdú ("Multiuser Detection", Cambridge, 1998).

As per claim 1, Verdú discloses a method of processing spread spectrum waveforms transmitted by a plurality of users of a spread spectrum system comprising computing a matrix representing cross correlations among the waveforms, the computing step including performing matrix calculation on at least a first one of two matrix components related by a symmetry property (chapter 4 section 4.2 page 168), to obtain a first portion of the cross correlation matrix the matrix components representing correlations among time lags and codes associated with the waveforms (chapter 4 section 4.2 page 168; the time lag are delays. The definition of cross-correlation is a convolution of a signal with the same signal delayed see equations 4.21 to 4.25 of Verdú); computing a second portion of the cross correlation matrix as a function of its first portion by applying the symmetry property (because the cross correlation matrix is symmetrical see equation 4.28 of Verdú, it is only need to compute a first portion of the matrix, the lower side of the diagonal, because the second portion, the upper side is identical, that is the reason why the matrix is symmetrical); generating detection statistics corresponding to the transmitted symbols as a function of the cross-correlation matrix (chapter 4 section 4.3 pages 176-194, Verdú presents how to compute the probability of error, BER using the cross correlation see equation 4.47); and estimating symbols transmitted by the respective users and encoded in the waveforms as a function of the cross correlation matrix (chapter 4 section 4.2 figure 4.10 pages 166-

175. In Verdú the estimated symbol are represented like $\hat{b}$ in figure 4.10 and are obtained using the Viterbi algorithm see page 172 equation after 4.38 Verdú discloses how the estimation of the transmitted symbol is function of the correlation matrix).

As per claim 4, Verdú discloses claim 1, Verdú also discloses that applying the symmetry property comprises computing utilizing a symmetry property of the cross-correlation matrix defined in accord with the relation $R_{l,k}(m) = \xi\ R_{k,l}(-m)$ where $R_{l,k}(m)$ and $R_{k,l}(-m)$ refer to (l,k) and (k,l) elements of the cross correlation matrix, respectively (chapter 4 section 4.2 pages 166-175. This is the definition of a symmetrical matrix with the value of $\xi=1$, that is a proportionality constant).

As per claim 17, Verdú discloses computing a matrix representing cross-correlations among the waveforms transmitted by the user as a function of a matrix that represents correlations among the time lags associated with the transmitted waveforms and code sequences associated with the respective users, the computing step comprising computing a first one of two symmetry related matrix components of the matrix (chapter 4 section 4.2 pages 166-175. First component upper triangular part, second component lower triangular part); computing a second portion of the cross correlation matrix as a function of its first portion by applying the symmetry property (because the cross correlation matrix is symmetrical see equation 4.28 of Verdu, it is only need to compute a first portion of the matrix, the lower side of the diagonal, because the second portion, the upper side is identical, that is the reason why the matrix is symmetrical); and generating estimates of symbols transmitted by the users and encoded in the waveforms as a function of the cross correlation matrix (chapter 4

section 4.2 figure 4.10 pages 166-175. In Verdú the estimated symbol are represented like $\hat{b}$ in figure 4.10 and are obtained using the Viterbi algorithm see page 172 equation after 4.38 Verdú discloses haw the estimation of the transmitted symbol is function of the correlation matrix).

As per claim 19, Verdú discloses claim 18, Verdú also discloses generating detection statistics corresponding to the transmitted symbols as a function of the cross-correlation matrix (chapter 4 section 4.3 pages 176-194, Verdú presents how to compute the probability of error, BER using the cross correlation see equation 4.47).

As per claim 20, Verdú discloses claim 19, Verdú also discloses generating estimates comprises utilizing the detection statistics to generate the estimates (chapter 4 section 4.2 pages 166-175).

Claims 1,4, 17 and 19-20 are rejected under 35 U.S.C. 102(e) as being anticipated by Moher (US 6161209 A).

As per claim 1, Moher discloses a method of processing spread spectrum waveforms transmitted by a plurality of users of a spread spectrum system comprising computing a matrix representing cross correlations among the waveforms, the computing step including performing matrix calculation on at least a first one of two matrix components related by a symmetry property (column 43 line 43 to column 44 line 53; and column 55 line 61 to column 56 line 65), to obtain a first portion of the cross correlation matrix the matrix components representing correlations among time lags and codes associated with the waveforms (column 43 line 43 to column 44 line 53; and column 55 line 61 to column 56 line 65; the time lag are delays. The definition of cross-

correlation is a convolution of a signal with the same signal delayed see equation 83 of Moher); computing a second portion of the cross correlation matrix as a function of its first portion by applying the symmetry property (because the cross correlation matrix is symmetrical, it is only need to compute a first portion of the matrix, the lower side of the diagonal, because the second portion, the upper side is identical, that is the reason why the matrix is symmetrical); generating detection statistics corresponding to the transmitted symbols as a function of the cross-correlation matrix (abstract; column 3 lines 5-20; column 7 lines 27-55; column 44 line 53 to column 45 line 50; and column 56 lines 11-20); and estimating symbols transmitted by the respective users and encoded in the waveforms as a function of the cross correlation matrix (column 44 lines 1-50; and column 56 lines 21-65, equations 83 – 86 shows how the estimation of the transmitted symbol is function of the correlation matrix).

As per claim 4, Moher discloses claim 1, Moher also discloses that applying the symmetry property comprises computing utilizing a symmetry property of the cross-correlation matrix defined in accord with the relation $R_{l,k}(m) = \xi R_{k,l}(-m)$ where $R_{l,k}(m)$ and $R_{k,l}(-m)$ refer to (l,k) and (k,l) elements of the cross correlation matrix, respectively (column 44 lines 1-10; and column 56 lines 43-65. This is the definition of a symmetrical matrix with the value of $\xi=1$, that is a proportionality constant).

As per claim 17, Moher discloses computing a matrix representing cross-correlations among the waveforms transmitted by the user as a function of a matrix that represents correlations among the time lags associated with the transmitted waveforms and code sequences associated with the respective users, the computing step

comprising computing a first one of two symmetry related matrix components of the matrix (column 43 line 43 to column 44 line 53; and column 55 line 61 to column.56 line 65. First component upper triangular part, second component lower triangular part); computing a second portion of the cross correlation matrix as a function of its first portion by applying the symmetry property (because the cross correlation matrix is symmetrical, it is only need to compute a first portion of the matrix, the lower side of the diagonal, because the second portion, the upper side is identical, that is the reason why the matrix is symmetrical); and generating estimates of symbols transmitted by the users and encoded in the waveforms as a function of the cross correlation matrix (column 43 line 43 to column 44 line 53).

As per claim 19, Moher discloses claim 17, Moher also discloses generating detection statistics corresponding to the transmitted symbols as a function of the cross-correlation matrix (abstract; column 3 lines 5-20; column 7 lines 27-55; column 44 line 53 to column 45 line 50; and column 56 lines 11-20).

As per claim 20, Moher discloses claim 19, Moher also discloses generating estimates comprises utilizing the detection statistics to generate the estimates (column 44 line 53 to column 45 line 50).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 5-8 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Verdú as applied to claim 4 above, and further in view of Schmidl (US 6816541 B1) (with Goeddel (US 6546026 B1) used for inherency in claims 8 and 10).

As per claim 5, Verdú discloses claim 4. Verdú doesn't specifically disclose that computing the cross-correlation matrix comprises computing a matrix that represents correlations among time lags and short codes sequences associated with the waveforms transmitted by the users and a matrix that represents correlations among multipath signal amplitudes associated with the waveforms transmitted by the users. Schmidl discloses computing the cross-correlation matrix comprises computing a matrix that represents correlations among time lags and short codes sequences associated with the waveforms transmitted by the users and a matrix that represents correlations among multipath signal amplitudes associated with the wavefoms transmitted by the users (column 10 line 30 to column 11 line 57). Verdú and Schmidl are analogous art because they are from the same field of endeavor. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to incorporate the multipath and short code cross correlation disclosed by Schmidl in the cross correlation matrix disclosed by Verdú. The suggestion/motivation for doing so would have been to obtain spread code period longer than a symbol period (column 2 lines 22-26).

As per claim 6, Verdú and Schmidl disclose claim 5. Verdú also discloses computing a first one of two matrix components related by a symmetry property (chapter 4 section 4.2 pages 166-175. First component upper triangular part and second component lower triangular part).

As per claim 7, Verdú and Schmidl disclose claim 6. Verdú also discloses computing a second one of the two matrix components as a function of the first matrix component by applying a symmetry property (chapter 4 section 4.2 pages 166-175. First component upper triangular part and second component lower triangular part).

As per claim 8 Verdú and Schmidl disclose claim 7. Verdú inherently discloses that the step of computing the C matrix comprises computing the Γ-matrix in accord with the relation $\Gamma_{l,k}[m] \equiv \frac{1}{2N_l}\sum_{n=0}^{N-1} c_l^*[n]c_k[n-m]$ wherein $c^*_l[n]$ represents complex conjugate of the short code sequence associated with the l^{th} user, $c_k[n-m]$ represents the short code sequence associated with k^{th} user, N represents the length of the code, and N_l represent the number of non-zero length of the code (this is the definition of cross-correlation, and the Applicant acknowledge this using the symbol $\equiv$, that means identical by definition. The term $\frac{1}{2N_l}$ is the normalization factor to obtain a cross correlation below the value of 1, n-m is the time lag. Goeddel discloses a similar equation in column 7 lines 10-32).

As per claim 10, Verdú discloses a method of processing spread spectrum waveforms transmitted by a plurality of users of a spread spectrum system comprising computing a matrix representing cross correlations among the waveforms, the computing step including performing matrix calculation on at least a first one of two matrix components related by a symmetry property (chapter 4 section 4.2 page 168), to obtain a first portion of the cross correlation matrix the matrix components representing correlations among time lags and codes associated with the waveforms (chapter 4

section 4.2 page 168; the time lag are delays. The definition of cross-correlation is a convolution of a signal with the same signal delayed see equations 4.21 to 4.25 of Verdú); computing a second portion of the cross correlation matrix as a function of its first portion by applying the symmetry property (because the cross correlation matrix is symmetrical see equation 4.28 of Verdú, it is only need to compute a first portion of the matrix, the lower side of the diagonal, because the second portion, the upper side is identical, that is the reason why the matrix is symmetrical); generating detection statistics corresponding to the transmitted symbols as a function of the cross-correlation matrix (chapter 4 section 4.3 pages 176-194, Verdú presents how to compute the probability of error, BER using the cross correlation see equation 4.47); and estimating symbols transmitted by the respective users and encoded in the waveforms as a function of the cross correlation matrix (chapter 4 section 4.2 figure 4.10 pages 166-175. In Verdú the estimated symbol are represented like $\hat{b}$ in figure 4.10 and are obtained using the Viterbi algorithm see page 172 equation after 4.38 Verdú discloses how the estimation of the transmitted symbol is function of the correlation matrix); applying the symmetry property comprises computing utilizing a symmetry property of the cross-correlation matrix defined in accord with the relation $R_{l,k}(m) = \xi\, R_{k,l}(-m)$ where $R_{l,k}(m)$ and $R_{k,l}(-m)$ refer to (l,k) and (k,l) elements of the cross correlation matrix, respectively (chapter 4 section 4.2 pages 166-175. This is the definition of a symmetrical matrix with the value of $\xi=1$, that is a proportionality constant); where the step of computing the C matrix comprises computing the Γ-matrix in accord with the

relation $\Gamma_{l,k}[m] \equiv \frac{1}{2N_l}\sum_{n=0}^{N-1} c_l^*[n]c_k[n-m]$ wherein $c^*_l[n]$ represents complex conjugate of the short code sequence associated with the l^{th} user, $c_k[n-m]$ represents the short code sequence associated with k^{th} user, N represents the length of the code, and N_l represent the number of non-zero length of the code (this is the definition of cross-correlation, and the Applicant acknowledge this using the symbol $\equiv$, that means identical by definition. The term $\frac{1}{2N_l}$ is the normalization factor to obtain a cross correlation below the value of 1, n-m is the time lag. Goeddel discloses a similar equation in column 7 lines 10-32). Verdú doesn't specifically disclose that computing the cross-correlation matrix comprises computing a matrix that represents correlations among time lags and short codes sequences associated with the waveforms transmitted by the users and a matrix that represents correlations among multipath signal amplitudes associated with the waveforms transmitted by the users. Schmidl discloses computing the cross-correlation matrix comprises computing a matrix that represents correlations among time lags and short codes sequences associated with the waveforms transmitted by the users and a matrix that represents correlations among multipath signal amplitudes associated with the waveforms transmitted by the users (column 10 line 30 to column 11 line 57). Verdú and Schmidl are analogous art because they are from the same field of endeavor. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to incorporate the multipath and short code cross correlation disclosed by Schmidl in the cross correlation matrix

disclosed by Verdú. The suggestion/motivation for doing so would have been to obtain spread code period longer than a symbol period (column 2 lines 22-26).

Claims 5-8 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Moher as applied to claim 4 above, and further in view of Schmidl (US 6816541 B1).

As per claim 5, Moher discloses claim 4. Moher doesn't specifically disclose that computing the cross-correlation matrix comprises computing a matrix that represents correlations among time lags and short codes sequences associated with the waveforms transmitted by the users and a matrix that represents correlations among multipath signal amplitudes associated with the waveforms transmitted by the users. Schmidl discloses computing the cross-correlation matrix comprises computing a matrix that represents correlations among time lags and short codes sequences associated with the waveforms transmitted by the users and a matrix that represents correlations among multipath signal amplitudes associated with the waveforms transmitted by the users (column 10 line 30 to column 11 line 57). Moher and Schmidl are analogous art because they are from the same field of endeavor. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to incorporate the multipath and short code cross correlation disclosed by Schmidl in the cross correlation matrix disclosed by Moher. The suggestion/motivation for doing so would have been to obtain spread code period longer than a symbol period (column 2 lines 22-26).

As per claim 6, Moher and Schmidl disclose claim 5. Moher also discloses computing a first one of two matrix components related by a symmetry property (column

55 line 61 to column 56 line 65. First component upper triangular part and second component lower triangular part).

As per claim 7, Moher and Schmidl disclose claim 6. Moher also discloses computing a second one of the two matrix components as a function of the first matrix component by applying a symmetry property (column 55 line 61 to column 56 line 65. First component upper triangular part and second component lower triangular part).

As per claim 8, Moher and Schmidl disclose claim 7. Moher inherently discloses that the step of computing the C matrix comprises computing the Γ-matrix in accord with the relation $\Gamma_{l,k}[m] \equiv \frac{1}{2N_l}\sum_{n=0}^{N-1} c_l^*[n]c_k[n-m]$ wherein $c^*_l[n]$ represents complex conjugate of the short code sequence associated with the l^{th} user, $c_k[n-m]$ represents the short code sequence associated with k^{th} user, N represents the length of the code, and N_l represent the number of non-zero length of the code (this is the definition of cross-correlation, and the Applicant acknowledge this using the symbol $\equiv$, that means identical by definition. The term $\frac{1}{2N_l}$ is the normalization factor to obtain a cross correlation below the value of 1, n-m is the time lag. Goeddel discloses a similar equation in column 7 lines 10-32).

As per claim 10, Moher discloses a method of processing spread spectrum waveforms transmitted by a plurality of users of a spread spectrum system comprising computing a matrix representing cross correlations among the waveforms, the computing step including performing matrix calculation on at least a first one of two matrix components related by a symmetry property (column 43 line 43 to column 44 line

53; and column 55 line 61 to column 56 line 65), to obtain a first portion of the cross correlation matrix the matrix components representing correlations among time lags and codes associated with the waveforms (column 43 line 43 to column 44 line 53; and column 55 line 61 to column 56 line 65; the time lag are delays. The definition of cross-correlation is a convolution of a signal with the same signal delayed see equation 83 of Moher); computing a second portion of the cross correlation matrix as a function of its first portion by applying the symmetry property (because the cross correlation matrix is symmetrical, it is only need to compute a first portion of the matrix, the lower side of the diagonal, because the second portion, the upper side is identical, that is the reason why the matrix is symmetrical); generating detection statistics corresponding to the transmitted symbols as a function of the cross-correlation matrix (abstract; column 3 lines 5-20; column 7 lines 27-55; column 44 line 53 to column 45 line 50; and column 56 lines 11-20); and estimating symbols transmitted by the respective users and encoded in the waveforms as a function of the cross correlation matrix (column 44 lines 1-50; and column 56 lines 21-65, equations 83 – 86 shows how the estimation of the transmitted symbol is function of the correlation matrix); applying the symmetry property comprises computing utilizing a symmetry property of the cross-correlation matrix defined in accord with the relation $R_{l,k}(m) = \xi\, R_{k,l}(-m)$ where $R_{l,k}(m)$ and $R_{k,l}(-m)$ refer to (l,k) and (k,l) elements of the cross correlation matrix, respectively (column 44 lines 1-10; and column 56 lines 43-65. This is the definition of a symmetrical matrix with the value of $\xi=1$, that is a proportionality constant); where the step of computing the C matrix comprises computing the Γ-matrix in accord with the relation $\Gamma_{l,k}[m] \equiv \frac{1}{2N_l}\sum_{n=0}^{N-1} c_l^{*}[n]c_k[n-m]$ wherein

$c^*_l[n]$ represents complex conjugate of the short code sequence associated with the l^{th} user, $c_k[n-m]$ represents the short code sequence associated with k^{th} user, N represents the length of the code, and N_l represent the number of non-zero length of the code (this is the definition of cross-correlation, and the Applicant acknowledge this using the symbol $\equiv$, that means identical by definition. The term $\frac{1}{2N_l}$ is the normalization factor to obtain a cross correlation below the value of 1, n-m is the time lag. Goeddel discloses a similar equation in column 7 lines 10-32). Moher doesn't specifically disclose that computing the cross-correlation matrix comprises computing a matrix that represents correlations among time lags and short codes sequences associated with the waveforms transmitted by the users and a matrix that represents correlations among multipath signal amplitudes associated with the waveforms transmitted by the users. Schmidl discloses computing the cross-correlation matrix comprises computing a matrix that represents correlations among time lags and short codes sequences associated with the waveforms transmitted by the users and a matrix that represents correlations among multipath signal amplitudes associated with the waveforms transmitted by the users (column 10 line 30 to column 11 line 57). Moher and Schmidl are analogous art because they are from the same field of endeavor. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to incorporate the multipath and short code cross correlation disclosed by Schmidl in the cross correlation matrix disclosed by Moher. The suggestion/motivation for doing so would have been to obtain spread code period longer than a symbol period (column 2 lines 22-26).

Allowable Subject Matter

Claims 11-16 are allowable.

The following is a statement of reasons for the indication of allowable subject matter: claims 11-16 are allowed because the references cited fail to teach, as applicant has, the equation presented in those claims, as the applicant has claimed.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Juan A. Torres whose telephone number is (571) 272-3119. The examiner can normally be reached on Monday-Friday 9:00 AM - 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mohammad H. Ghayour can be reached on (571) 272-3021. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Juan Alberto Torres
06-20-2006

TEMESGHEN GHEBRETINSAE
PRIMARY EXAMINER
7/6/06